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Parents or teachers: who play a more important role in influencing children's academic gains in early childhood education?

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Abstract

Finding ways to increase the effectiveness of early childhood education has been a big concern for many educators and policymakers. In an attempt to solve this problem, they are faced with a dilemma of whether to concentrate on parent or teacher inputs. Previous research has studied the impact of either teacher or parent factors on students' academic performance. However, not many papers narrow their focus to the outcomes from early childhood programs. Using the National Center for Early Development and Learning (NCEDL) Multistate Study of Pre-Kindergarten (2001-2003) data, the paper aims to fill in this gap in the literature. Multiple linear regressions are used to weight the relative importance of teacher- and parent-related inputs on children's academic gains. It is found that, while teacher's education is positively correlated with better outcomes, parent inputs, especially parental involvement, are bigger determinants of children's academic outcomes and behaviors. These findings suggest which factors policymakers, with limited resources, should focus more on during education reform.

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1. Introduction

One of the many challenges today's society faces is how to reduce achievement disparities among students from diverse socioeconomic, racial and ethnic background (Marjoribanks, 2002). Many studies indicate that the disparities begin early and keep accumulating throughout one's life. Heckman (2008) found that gaps in test scores start early and persistent while Chunha and Heckman (2008) showed that about half of the inequality in the present value of lifetime earnings is due to factors determined by age 18. These factors mainly occur in forms of family's investment in young children. A child born into a disadvantaged family is less likely to receive a sufficient amount of resources which will help them prepare for higher education in the future. In fact, cognitive ability, primarily developed in the early days, is the strongest predictor of college attendance (Carneiro and Heckman, 2002). This implies that an insufficient amount of support students received in their early days has a long-lasting impact on their lives, underlying the importance of child early childhood developments and interventions.

Moreover, as shown by various research, the extent of a human brain's ability to absorb new information changes over time (White et al., 2013). The brain's ability to rewire to adapt to different circumstances and memorize new information is called brain plasticity or neuroplasticity. In many dimensions, the degree of plasticity is higher in the early years. Gopnick et al. (1999) stated that at birth, each neuron[1] in the cerebral cortex has approximately 2,500 synapses, a pathway that allows information to flow from one neuron to another neuron. By the time an infant is two or three years old, the number grows to approximately 15,000 synapses per neuron. This number is about twice the size of the average adult brain. The fact showcases how a child's early years are a critical and sensitive period for learning and that investments in early childhood education can potentially create a significant benefit for the child.

As policymakers and educators are made aware of early childhood's importance, pre-kindergarten programs have become a primary strategy for addressing inequality among children. Past research indicates that participating in early childhood programs is one way to reduce this tenacious inequality. Participation in early childhood programs is correlated to higher academic and social readiness for school, with higher quality programs linked to greater gains, particularly for the most disadvantaged students (Garces et al, 2002, Gormley et al., 2005, Howes et al., 2008). However, due to the high cost of the programs, ranging from the average of $5,307 in Mississippi to $20,415 in

[1] Neurons are specialized cells designed to transmit information to other nerve cells, muscle or gland cells. It can be described as growing telephone wires that communicate with one other (Gopnick et al., 1999)

Massachusetts, not every family can afford to send their children to child care (Child Care Aware of America, 2018). Because of this reason, states and federal government have sought to increase the participation of low-income children in early childhood education programs through various ways: Head Start, state-funded pre-kindergarten programs, and more (Duncan and Katherine, 2013).

These early childhood programs have proven to create long-lasting social benefits for children. Schweinhart et al. (2005) found that participation in Perry Preschool, an early childhood education program for young children living in poverty, creates many long term benefits. For example, at the age of 40, significantly more of the program group were employed than the no-program group (76% vs. 62%). The program group also had significantly higher median income than no-program group at ages 27 and 40 ($12,000 vs. $10,000 at age 27 and $20,800 vs. $15,300). Besides jobs and earning, the program group also had significantly fewer lifetime arrests than the no-program group (36% vs. 55% arrested five or more times).

Similar positive effects can be seen in the Abecederian program. Significantly more participants of Abecedarian program attended college than the non-participants (36% vs. 13%) and fewer of them needed to repeat a grade (34% vs. 65%). In terms of health benefits, the rate of smoking was lower in the program group when compared to the no-program group (39% vs. 55%) (Barnett and Masse, 2007).

These results show how participation in early childhood education can significantly impact a child's future. With that being said, the effects on social factors might not be enough. To efficiently reduce inequality, it is important to ensure these early childhood programs will create long-lasting academic impacts as well. The Head Start Impact Study, beginning in 2002, demonstrates how children randomly selected to enroll in a Head Start[2] program, gained significantly more in six language and literary areas than control-group of children who were not selected (US Department of Health and Human Services 2005). However, by the end of first grade, both achievement levels and behavioral ratings of treatment group children were essentially similar to those of the control group (US Department of Health and Human Services 2010). Early quasi-experimental evaluations of Head Start also found similar results of short-term gains in children's achievement that faded out over time (Circirelli, 1969, McKey et al., 1985).

[2] Head start is a federally sponsored early childhood education program that provides comprehensive services to low-income preschool children and their families across the United States (Morris, 2018)

Studies conducted to investigate the effects of pre-kindergarten programs also obtain similar results. While there are some short-run effects on achievement test scores, the effects do not last long (Wong 2008). In fact, Hill, Gormley and Adelstein (2012) found no discernible achievement impacts for the students who went through pre-kindergarten program by the time they got to third grade. The lack of long-run academic benefits of early childhood programs suggests that the current structure of these programs does not do enough to impact long-term development for children and some modifications are needed to raise the program's standard.

Policymakers are then faced with questions concerning how to efficiently improve the quality of the program to sustain academic benefits. With this regard, many often consider setting professional development standards. On the one hand, having highly qualified teachers, measured by years of experience, highest degree teaching certification, and college majors, might help create a longer-lasting impact on children's performance. On the other hand, it is also crucial to recognize the influence family can potentially have on children's outcomes. Zhai, Raver, and Jones (2012) found that the benefits children received from Head Start programs persisted in kindergarten only for those children who received support from their parents and got sent to higher-quality elementary schools. So both school and parent inputs are essential. With this, increasing teacher's requirements in early childhood programs might not be as important as raising parents' awareness about the importance of education and providing them with the means to support their children.

This paper aims to help policymakers and educators solve this dilemma by evaluating the effects of teacher and parent inputs on the children's academic gains. To do so, data from the Early Development and Learning (NCEDL) Multistate Study of Pre-Kindergarten (2001-2003) is used. The Big Five Personality Traits and parental involvement indices are developed and analyzed along with other parent- and teacher-related factors from the dataset using multiple linear regression. Besides facilitating the decision-making process of the policymakers, this paper also aims to fill in the gap in the literature by studying the impact of teacher and parent inputs on academic gains of four-year-olds attending pre-kindergarten programs of six states; something that has not been extensively studied before.

Section 2 reviews the existing literature related to this topic. The process of how the Big Five Personality Traits and parental involvement indices are calculated can be found in Section 3. Section 4 describes the dataset while Section 5 explains the main empirical models. The results can be found in Section 6 and robustness checks in Section 7. Section 8 discusses the main results while Section 9 concludes.

2. Literature Review

Teacher's education and credentials

According to Dewey (1923), education is the process of acquiring new knowledge, skills, and habits that occurs within the formal education system. It is commonly known in child care literature that higher levels of teacher education are positively linked to the quality of education provided to the children and children's academic performance (Blau, 2000, Howes, Whitebook and Phillips, 1992, NICHD Early Child Care Research Network, 2002).

Despite an abundance of research, there is still an ongoing debate about the connection between teachers' level of education and teaching quality. Harris and Sass (2011) mentioned how recent research mostly indicated an insignificant relationship between possession of graduation degrees by teachers and the outcomes of their students in both math and reading. Their own findings also showcased inconsistent associations between professional development training, through attaining higher education, and teacher's productivity. Another study found that the relationship between teachers' education and classroom quality significantly weakened when other structural features of the setting, for example, teacher wages, were taken into consideration (Phillipsen et al., 1997). Similarly, Budding and Zamarro (2009) founded that student achievement is unaffected by the teacher's attainment of advanced degrees. Burchinal et al. (2000) also pointed out that a connection between teacher's education and students' academic skill only occurs in girls, not boys.

Although an increase in teacher's level of education does not always relate to an improvement in student's performance, the specific degree attained by a teacher may be necessary to ensure sufficient classroom quality. In other words, there might be a *threshold* in education attained that teachers need to cross. In Whitebook (2003)'s review, it was concluded that students taught by teachers with an Associate's or Bachelor's degree had stronger receptive vocabularies than those taught by teachers with a high school diploma. Retaining teachers with bachelor's degrees was also one of the strongest predictors that influence classroom quality over time. Similarly, it was shown by Howes (1997) that teaching quality was higher in preschool classrooms where teachers had a Bachelor's degree than in those where teachers only had an Associate's degree. Due to the possible existence of the *threshold*, Barnett (2003) advocated for a policy requiring preschool teachers to have at least a Bachelor's degree to ensure high quality of teaching. Despite an abundance of research, not many papers study teacher's education that goes beyond a Bachelor's degree as it was previously perceived as uncommon in early childhood education. However, with a Bachelor's degree becoming

a norm for preschool teachers, this paper aims to investigate the impact of all levels of education attained by teachers to see if it is significant.

Besides the level of education, the content of education may also affect classroom quality and sequentially students' outcomes. If teachers' education is crucial mainly because it provides teachers with insights into how to effectively teach, then the content of the teacher's education (e.g. their majors in college) would be important in advancing child outcomes (Early et al, 2006). However, if the content of the teacher is not important, then by requiring teachers to obtain certain degrees/ study certain majors might jeopardize some qualified teachers from entering the workforce and make the administrative cost of early childhood programs unnecessarily high. Holdhaber and Dominic (1996) found that teachers' specialization and subject-specific trainings result in better student outcomes in those subjects. Whitebook (2003) found that it is more likely for teachers who specialized in early childhood education, from obtaining a four-year degree, to have positive interaction with children than those without similar credentials. Likewise, Tout et al. (2006) suggested that, in general, teachers with higher levels of early childhood-specific education provide higher quality in preschool teaching.

In this paper, it is assumed that if the education-specific content plays a vital role in determining classroom quality, then teachers with education degrees will provide better teaching quality, leading to stronger academic outcomes, than those with the same level of education who were not education majors.

Teaching experience

Teachers' teaching experience can also influence students' academic outcomes. Findings from Adeyemi (2008) revealed how an increase in years of teaching experience can significantly enhance the academic performance of students in public schools. The results from Kini and Podolsky (2016)'s review also confirmed that teaching experience is positively associated with student academic gains throughout a teacher's career. Teacher effectiveness also grows with experience, with the growth being the highest during the teachers' initial years. In addition, Ladd and Sorensen (2015) underlined that teaching experience does not only correlate with higher test scores but also with improvements in student behavior, especially in student absenteeism.

Parental involvement

Besides studying how teacher inputs may influence students' academic outcomes during their early years, it is also important to see how parent inputs affect these outcomes as well. This will help determine whether teacher- or parent-related factors are more important in shaping a child's future, as measured by their academic performance and behaviors. Parental involvement can be considered as a broad range of activities. It can be helping children with their homework, sending materials to class, attending parent- teacher conferences, or somewhere in between. Due to its flexible nature, different researchers, in the past, have had different ways of defining parental involvement. Regardless of its definition, parental involvement is consistently found to be positively related to students' better academic performance (Hoover-Dempsey and Sandler, 1997). Hayakama et. al (2013) indicated how early parent involvement directly influenced achievement in kindergarten, which also had a positive spillover effect on students' motivation in first grade. Luchuck (1998), found a meaningful relationship between parental involvement and children's academic gains. Moreover, it is also recognized that parental expectations and beliefs about education are one of the most influential family variables that have an impact on children's achievement in school (Fan and Chen 2001).

Family income

An extensive body of literature has documented the importance of parents' socioeconomic background on students' outcomes. Sewell, Hauser and Wolf (1980) demonstrated that children from families with a higher socioeconomic background tend to obtain more years of schooling. Taylor (2005) expressed how students from upper-income families often outperform low-income students. In addition, Reardon (2011) emphasized the widening achievement gap between children from high- and low-income families. The achievement gap is around 30 to 40 percent larger among children who were born in 2001 than among those who were born 25 years earlier. It is also important to recognize the positive correlation between family income and parental involvement. However, with that being said, the effect of parent income on students' academic performance during their early years has not been extensively discussed in the literature

Parent's level of education

Studies in the past have consistently shown the strong relationship between parent's education and children's achievement (Klebanov et al., 1994). Hanely and Mckeever (1997) explained how the children's likelihood to enter postsecondary education is influenced by their parents' educational attainment. Between parents from two social groups, children of professionals are more likely to obtain higher education than those of administrators. Besides receiving higher education, Dronkers (1994) found that parent's educational level is also a strong predictor of children's academic outcomes. Telling the same story, Khan, Iqbal and Tasneem (2015) pointed out a significant positive relationship between parents' education and academic outcomes of students. Therefore, it would be interesting to see to what extent do these parental factors, when compared to teacher-related factors, affect student's academic success.

Big Five personality traits

Many papers in the literature have studied the impact of either teacher or parent factors on students' academic performance. However, not many papers narrow their focus to the outcomes from early childhood programs. This paper aims to fill in this gap in the literature by studying the impact of teacher and parent inputs on academic gains of four-year-olds attending pre-kindergarten programs of six states. By doing so, the paper will help weight the relative importance of teacher- and parent-related factors to see which factors policymakers, with limited resources, should focus more on.

Besides using direct academic outcomes, such as math and language scores, this paper also adopts the Big Five personality traits measurement to quantify children's academic behaviors. The Big Five personality traits are a taxonomy for grouping for personality traits, which consists of Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. It is argued that most of the variables used to assess personality in academic research in the field of personality psychology can be categorized into one or more dimensions of the Big Five (John, 1990, Costa and McCrae, 1992). Since personality traits are responsive to policy intervention, parental behavior, and more, the Big Five are often used by researchers to study academic behaviors (Almlund et al., 2011, Poropat, 2009). Nye, Orel, and Kochergina (2013) found that Extraversion, Agreeableness, Neuroticism, and Openness are positively correlated to academic performance.

3. Theoretical Framework

Big Five Personality Traits Index

The Big Five personality traits index is computed based on questionnaires given to classroom teachers. The teachers were sent a list of questions concerning the students' behaviors and asked to indicate if the students had any behavior issues on the list. The students got assigned different scores depending on their behaviors.

$$Behavior_i = \begin{cases} 0, if\ indicated\ as\ a\ serious\ problem \\ 1, otherwise \end{cases}$$

The behaviors are then categorized into five personality dimensions based on the definitions provided by Heckman and Kautz (2013)[3]. The score assigned to different behaviors under the same personality dimension are added together and normalized to be out of one.

$$Personality\ Dimension_i = \frac{\sum_{j=1}^{n} Behavior\ score_j}{n}$$

Parental Involvement Index

The parental involvement index consists of seven parental behaviors as rated by teachers: the parent's frequency of calling teachers, visiting teachers, attending parent-teacher conferences, attending special events, sending material to classroom, volunteer, and how cooperative they are. The sum of the scores is normalized by the maximum score available, making the index to be out of one. The higher the score the more involved the parents are in their child's academics. More information on the data used is discussed below.

[3] See Appendix I for the definitions and the list of behaviors

4. Data

This paper uses the data from the National Center for Early Development and Learning (NCEDL) Multistate Study of Pre-Kindergarten (2001-2003), involving around 240 fully or partially state-funded pre-kindergarten classrooms and over 800 four years olds in six different states. These six states: California, Illinois, New York, Ohio, Kentucky, and Georgia were selected based on the significant amount of resources contributed to pre-k initiatives. Due to budget and time constraints, the data from California and New York is only limited to certain regions: greater Los Angeles area, California's Central Valley, New York City, and area within a 50-mile radius from Albany, New York. This sample is meant to be representative of the pre-k classrooms and children attending those classrooms in the four states and two regions.

Within each state, a random sample of 40 centers/ schools was selected and one classroom within that school was chosen at random for observation. Four children in the chosen classroom were then picked for individual assessments. This data set contains information on classroom services and specific instructional practices, children and families which is useful for this analysis.

Classroom Services and Specific Instruction Practices

Within the 40 classrooms in each participating state, data on teacher training and education, teachers' characteristics, teaching credentials, and their teaching experience were collected through surveys sent to administrators/principals and the teachers themselves. Table 1 shows an overview of teachers' educational background and characteristics.

Table 1: Characteristics of the teachers

Variables	Percent
Teacher's Gender	
Male	1.67
Female	98.33
Teacher's Race	
Latin American	11.91
African American	17.45
Asian	3.83
White	61.70
Multiracial	5.11
Teacher's Education Level	
Less than Bachelor's degree	40.42
Bachelor's degree or higher	59.58
Teacher's Major	
Education Majors	46.25
Other Majors	53.75
Teacher with State Certificate (to teach 4 years old)	
Has a BA or better, but no State Certificate	52.54
Has a BA or better, and has State Certificate	47.46
Teaching Experience (years)	13.17

This sample consists of mostly female teachers with a majority of them being white. Over 50 percent of the teachers obtained a bachelor's degree or higher. For those who graduated from college, around 46 percent of them per education or education-related majors. Among those teachers with a bachelor's degree or higher, 47.46 percent of them also have state certification to teacher four years olds.

Children

Within each participating pre-k classroom, four children were randomly selected to assess their language- and mathematics-related concept development. The students' language-related development was measured by their ability to recount/ name the 26 English alphabets while their mathematics-related development measured how many numbers they can name from zero to nine. Besides information on the children's academic performance, some information on students' characteristics, such as gender and ethnicity, was also collected.

Table 2: Characteristics of the children

Variables	Percent
Child's Gender	
Male	48.87
Female	51.13
Child's Ethnicity	
Latino	25.13
African American	24.12
Native American	0.50
Asian American	1.41
White	40.60
Multiracial	8.24

Table 3: Children's academic outcomes

Variables	Mean	Std.Dev.	Min	Max
Children outcome: Mathematics (%)	62.45	37.29	0	100
Children outcome (K): Mathematics (%)	96.19	12.46	0	100
Children outcome: Language (%)	46.34	36.24	0	100
Children outcome (K): Language (%)	92.28	16.35	0	100
Personality Traits: Conscientiousness	.982	.085	.167	1
Personality Traits: Extraversion	.988	.1	0	1
Personality Traits: Openness	.991	.094	0	1
Personality Traits: Agreeableness	.97	.128	0	1
Personality Traits: Emotional Stability	.985	.072	.4	1

The children's gender is almost evenly split between male and female and the children are predominantly white. On average, the children were able to name 46.34 percent of the alphabets or around seven out of the 26 alphabets and recognized 80.11 percent of the numbers, which is around eight out of ten letters in pre-kindergarten. As the children advanced to kindergarten, the average score increased to 96.19 and 92.28 percent for math and language respectively. The average score for each

of the Big Five dimension is quite high: the score for openness being the highest and agreeableness being the lowest.

Families

Individual home-based interviews were conducted to obtain information on the parents' socio-economic status, family educational background and practices, and their beliefs about the comparative roles of school and family in educating children.

Table 4: Characteristics of the parents

Variables	Percent
Child's Family Income	
Below $45,000	78.49
$45,000 or more	21.51
Mother's Education Level	
Less than Bachelor's degree	83.55
Bachelor's degree	10.84
Higher than Bachelor's degree	5.62

Variable	Mean	Std.Dev.	Min	Max
Parental Involvement	.397	.138	0	1

Parental Involvement Variables	Mother's Education Level		
	Less than Bachelor's Degree	Bachelor's Degree	More than Bachelor's Degree
Calling Teachers	.302	.347	.377
	(.248)	(.246)	(.292)
Level of Cooperation	.814	.892	.842
	(.237)	(.175)	(.239)
Attending Parent Teacher Conference	.246	.25	.245
	(.128)	(.108)	(.148)
Volunteering in Classroom	.278	.273	.259
	(.281)	(.262)	(.254)
Sending Material to Class	.227	.285	.241
	(.22)	(.201)	(.233)
Attending Special Events	.273	.3	.273
	(.187)	(.199)	(.202)
Visiting Teachers	.599	.65	.627
	(.317)	(.306)	(.308)
Parental Involvement Index (Average Score)	0.391	0.428	0.409

As the median household income in 2001 was $42,288[4], around 78 percent of the children's families had income lower than the national median level. Less than 20 percent of the children's mother obtained a bachelor's degree or higher. The average parental involvement index score is 0.397 out of 1. The index score is the highest among the group of mothers with a bachelor's degree, followed by mothers with higher than a bachelor's degree and mothers with less than a bachelor's degree.

[4] This number comes from the U.S. Census Bureau (DeNavas-Walt, Cleveland and Roemer, 2001).

5. Empirical Model

Multiple log-level linear regressions are used to explore the relationship between teacher characteristics, parental involvement, and students' direct academic outcomes. Log-level linear regressions are used instead of regular regressions because a unit change in the score for each outcome yields different levels of students' academic improvements. This is because the language outcome is out of 26 while the mathematics outcome is only out of ten. Because of this, looking at percent changes in test scores will give a more standardized way comparing how independent variables affect each dependent variable.

Multiple level-level linear regressions are adopted to study the relationship between teacher characteristics, parental involvement, and students' academic outcomes, measured by test scores.

Two sets of four OLS regressions are run for each teacher's characteristic of interest:

$$\log(direct\ academic\ outcomes) = \beta_0 + \beta_1\theta_i + \beta_2\alpha_i + \varepsilon_i \quad (1)$$

$$\log(direct\ academic\ outcomes) = \beta_0 + \beta_1 pv + \beta_2\eta_i + \varepsilon_i \quad (2)$$

$$\log(direct\ academic\ outcomes) = \beta_0 + \beta_1 pv + \beta_2\theta_i + \beta_3\alpha_i + \beta_4\eta_i + \varepsilon_i \quad (3)$$

$$\log(direct\ academic\ outcomes) = \beta_0 + \beta_1 pv + \beta_2\theta_i + \beta_3\alpha_i + \beta_4\eta_i + \beta_5\lambda + \varepsilon_i \quad (4)$$

where:

- θ_i is a teacher's characteristic of interest
- α_i are teacher's control variables
- pv is the parental involvement index
- η_i are parent's control variables
- λ the interaction between mother's education and teacher's characteristic

Another set of level-level OLS regressions similar to the ones above was computed with direct academic outcomes being replaced by Big Five personality traits index.

The teacher's characteristics of interest are teacher's education, major in college, and teaching experience. These three characteristics are what policymakers often look into when they try to increase the quality of teaching in classrooms. The *teacher's education* variable is binary separating those who received a bachelor's degree or higher from those with less than a bachelor's degree. Similarly, the *teacher's major* variable is also binary separating education majors from non-education majors.

The teaching *experience variable* also acts as one of the control variables when *teacher's education* is the variable of interest. Originally, it was intended to include the three variables of interest into one regression, but that would create an issue of multicollinearity as those who did not attend college would not have a major. Due to this reason, these two variables are computed separately. Another control variable is *teacher's gender*. As one's gender can play a role in influencing one's behavior and decision, it is important to add teacher's gender to the regressions to eliminate any bias.

The parent's control variables include *mother's education* and *family income*. Mother's education can affect both children's outcomes (both academic behaviors and academic outcomes) and parental involvement index. Attaining a high level of education can be an indicator of the mother's view towards education. The mother's perception towards education might influence the child's perception, affecting their academic behaviors and outcomes. Moreover, seeing the importance of education, the mother might be more involved in their child's academics and school life, increasing the parental index score. The *mother's education* variable is categorized into less than a bachelor's degree, a bachelor's degree, and higher than a bachelor's degree. The other parent's control variable included is family income. Family income can affect the parental involvement index as low-income families might have to spend more time working, decreasing their availability to be involved. The children from low-income families might also not have enough academic resources, affecting both their academic outcomes and behavior.

6. Results

Teacher's education and academic outcomes

The full results of the regressions are displayed in **Appendix II**. The following tables only display the selected results that are crucial to the analysis.

Table 5: Academic outcomes vs. teacher's education

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Education: Less than Bachelor's Degree	-0.0814^{+}	-0.0276*	-0.122	-0.0449*
	(0.0490)	(0.0124)	(0.0787)	(0.0202)
N	733	833	756	834
R^2	0.008	0.010	0.005	0.007

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$

The pre-kindergarten students who were thought by teachers with attained education less than a bachelor's degree are expected to score 8.14 percent less in mathematics ($p < 0.10$) and 12.2 less in language when compared to those taught by teachers with a bachelor's degree or higher, holding other variables constant. Although only one of the results is significant at the ten percent significance level, the expected differences in the scores are notable as the average mathematics score and language score in pre-kindergarten is around 62 percent and 46 percent respectively. Moreover, the standard deviation for the mathematics score is 37.29 while that of language score is 12.46. This implies that the teacher's education explains the variation in test scores to an extent. As the same set of students moved on to kindergarten, the effects of being taught by teachers with less than a bachelor's degree in pre-kindergarten on their kindergarten scores fade out notably.

The kindergarten students who were taught by pre-kindergarten teachers with less than a bachelor's degree are anticipated to score 2.76 percent less in mathematics and 4.49 percent less in language, controlling for other variables. Although the magnitude of the predicted decreases is not as large anymore, it is interesting to see how the results become significant at the five percent significance level. This aligns with the idea that early childhood education has a long-term impact on the children,

seeing how the teacher's characteristic in pre-kindergarten plays a statistically significant role in the student's kindergarten scores.

The scores of children taught by female teachers in pre-kindergarten are predicted to be higher than those of children taught by male teachers except for kindergarten math scores. However, the magnitude of the effect fades out over time. Moreover, as the teaching experience increases by one year, the mathematics score in pre-kindergarten is expected to increase by 0.702 percent while the language score is expected to decrease by 1.15 percent. The extent of these differences is relatively small and none of the results are significant at the ten percent significance level.

Table 6: Academic outcomes vs. parental involvement

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Parental Involvement	0.293	-0.0152	0.337	0.00122
	(0.180)	(0.0472)	(0.293)	(0.0764)
N	667	766	692	768
R^2	0.032	0.010	0.039	0.015

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$

In the case of parental involvement, children whose parents are heavily involved with their academics are expected to score around 29.3 percent higher in mathematics and 33.7 percent in language when compared to those children whose parents are not involved in their academics at all. Another explanation of the relationship is that as the parental involvement index increases by one standard deviation, the students' scores in pre-kindergarten are predicted to increase by 0.063 deviations in mathematics and 0.043 deviations in language. The extent of scores' difference resulted from parental involvement (or the lack of) is much greater than that resulting from teacher's education.

The parental involvement index is negatively correlated with both mathematics scores in kindergarten although the result is not statistically significant. The pre-kindergarten test scores are expected to be higher among children with mothers with a bachelor's degree, compared to those with mothers with lower or higher than a bachelor's degree. The results are statistically significant at the five percent level. Family income is also positively correlated with test scores, as family income

increases by $1,000, the scores are expected to increase by 0.25 percent in mathematics ($p < 0.05$) and 0.4 percent in language ($p < 0.05$).

Table 7: Academic outcomes vs. teacher's education and parental involvement

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Education: Less than Bachelor's Degree	-0.0127	-0.0256^{+}	-0.0329	-0.0353
	(0.0523)	(0.0140)	(0.0843)	(0.0227)
Parental Involvement	0.286	-0.0367	0.282	-0.0158
	(0.185)	(0.0485)	(0.299)	(0.0783)
N	658	748	681	750
R^2	0.037	0.020	0.039	0.019

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$

When combining teacher and parent inputs into one regression, the predicted coefficients of teacher's education reduce drastically in pre-kindergarten scores. Holding other variables constant, the pre-kindergarten students taught by teachers with less than a bachelor's degree are expected to score around 1.27 percent less in mathematics and around 3.2 percent less in language (compared to 8.14 percent in mathematics and 12.2 percent in language from before). The coefficients of parental involvement remain relatively the same as the ones in Table 6. This might imply that parental involvement plays a more important role in influencing children's academic outcomes than teacher's education.

Teacher's education and academic behaviors

The full results of the regressions are displayed in **Appendix III**. The following tables only showcase some of the selected results.

Table 8: Academic behaviors vs. teacher's education

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Education: Less than Bachelor's Degree	-0.00587	0.000297	-0.00206	-0.00910	-0.00156
	(0.00542)	(0.00619)	(0.00593)	(0.00835)	(0.00452)
N	989	989	989	989	989
R^2	0.023	0.001	0.001	0.012	0.009

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$

Table 8 shows mixed relationships between teacher's education and Big Five personality traits[5]. The pre-kindergarten students taught by teachers with less than a bachelor's degree are expected to score less in all personality dimensions except extraversion. The magnitude of the differences also varies across different personality dimensions. The differences are not drastic when compared to the standard deviations of these traits. The control variables: teacher's gender and teaching experience also have mixed relationships with the personality traits.

Table 9: Academic behaviors vs. parental involvement

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Parental Involvement	0.0561*	0.0492^{+}	0.0422^{+}	0.0992*	0.0550*
	(0.0216)	(0.0253)	(0.0227)	(0.0323)	(0.0187)
N	855	855	855	855	855
R^2	0.016	0.005	0.005	0.015	0.012

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$

[5] There are more observations in personality traits' regressions than in academic outcomes' regressions because some students in the sample might leave the school (and got replaced) before they had a chance to take the exams.

On the other hand, parental involvement index has a clear positive correlation with all of the Big Five personality traits. One standard deviation increase in parental involvement index is expected to raise the score by 0.089, 0.067, 0.064, 0.105 and, 0.1 deviations in conscientiousness, extraversion, openness, agreeableness, and emotional stability respectively. Table 9 demonstrates the difference in Big Five index scores between children whose parents are completely involved in their academics and those whose parents are not involved at all. The results are all significant at the ten percent, while some are also significant at the five percent level.

Table 10: Academic behavior vs. teacher's education and parental involvement

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Education: Less than Bachelor's Degree	-0.00105	-0.000931	-0.00159	-0.00792	0.000364
	(0.00614)	(0.00689)	(0.00628)	(0.00949)	(0.00524)
Parental Involvement	0.0477*	0.0393	0.0356	0.0953*	0.0510*
	(0.0213)	(0.0239)	(0.0218)	(0.0329)	(0.0182)
N	835	835	835	835	835
R^2	0.040	0.005	0.005	0.030	0.023

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$

When the teacher's education and parental involvement variables are combined into one regression, the size of the teacher's education variable decreases in most cases. One interesting founding is extraversion now becomes negatively correlated with the teacher's education variable while emotional stability becomes negatively correlated. The results are not statistically significant. On the other hand, the parental involvement coefficient remains relatively the same; it is positively correlated with all the personality traits and three out of five results are statistically significant at the five percent level.

Teacher's major and academic outcomes

Please refer to **Appendix IV** for the full regression results.

Table 11: Academic outcomes vs. teacher's major

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Major: Education	0.0419	-0.0180	0.0345	0.0117
	(0.0477)	(0.0121)	(0.0766)	(0.0198)
N	733	833	756	834
R^2	0.005	0.007	0.002	0.002

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$

The students taught by teachers who were education majors in college are expected to score higher in pre-kindergarten mathematics and language by 4.19 percent and 3.45 percent respectively. The effects of pre-kindergarten teacher's majors on test scores decrease drastically as the students advanced to kindergarten. In this case, the teacher's major (education major) is negatively correlated with kindergarten math scores while positively correlated with kindergarten language scores. Since none of the coefficients are significant, it is safe to assume that there is no significant relationship between studying education in college and student outcomes.

In most cases, expected scores increase as teaching experience increases although the size of the increase goes down per each additional year of experience (quadratic relationship). Being taught by female teachers is generally correlated with higher test scores with a 20.1 percent increase in pre-kindergarten mathematics and a 17.2 percent increase in pre-kindergarten language.

Table 12: Academic outcomes vs. teacher's major and parental involvement

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Major: Education	0.0329	-0.0233^{+}	0.0297	0.00428
	(0.0489)	(0.0132)	(0.0794)	(0.0214)
Parental Involvement	0.292	-0.0276	0.297	-0.00170
	(0.183)	(0.0482)	(0.295)	(0.0779)
N	658	748	681	750
R^2	0.037	0.020	0.039	0.016

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$

Similar to those of the teacher's education, the coefficients of teacher's major variable decrease as the parental involvement index is added to the regression (except in kindergarten math's case). However, the change is not that drastic. The parental involvement variable remains relatively the same when compared to the results in **Table 6**. By looking at the size of the coefficient, it is clear that parental involvement plays a more vital role in influencing academic outcomes, especially in pre-kindergarten.

Family income continues to play a role in affecting academic outcomes as well. Academic outcomes in pre-kindergarten are expected to increase by 0.261 percent in mathematics and 0.380 percent in language as family income increases by $1,000. The results are statistically significant at the five percent level. Students whose mothers have a bachelor's degree are also expected to score higher than other students. In pre-kindergarten, students whose mother received a bachelor's are expected to score higher in mathematics and language by 14.9 ($p < 0.05$) and 35.8 percent ($p < 0.05$) than those students whose mothers have less than a college education. The pre-kindergarten students whose mothers received higher than a college education are expected to score 9.94 in mathematics and 23 percent higher in language when compared to the left-out group. As the parental involvement score is the highest in "mothers with a bachelor's degree" group, followed by "mothers with more than a bachelor's degree" and "mothers with less than a bachelor's degree", it is interesting to see how students' academic outcomes are also represented in that order.

Teacher's major and academic behaviors

Complete results of the regressions are displayed in **Appendix V**.

Table 13: Academic behaviors vs. teacher's major

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Major: Education	-0.0121*	-0.000507	0.00286	-0.00388	-0.00198
	(0.00526)	(0.00602)	(0.00577)	(0.00813)	(0.00440)
N	989	989	989	989	989
R^2	0.027	0.001	0.001	0.011	0.009

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$

Teacher's major is negatively correlated with most of the personality traits: conscientiousness, extraversion, agreeableness, emotional stability and is positively correlated with openness. However, comparing the results to the standard deviation, the teacher's major variable does not explain much about the variation of these personality traits. Teaching experience is positively correlated with the Big Five, except for the extraversion dimension, with the size of the increase going down per each additional year of experience.

Table 14: Academic behaviors vs. teacher's major and parental involvement

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Major: Education	-0.0120*	0.000192	0.00409	-0.00303	-0.00210
	(0.00578)	(0.00650)	(0.00592)	(0.00895)	(0.00494)
Parental Involvement	0.0476*	0.0397+	0.0364+	0.0980*	0.0508*
	(0.0211)	(0.0238)	(0.0217)	(0.0328)	(0.0181)
N	835	835	835	835	835
R^2	0.045	0.005	0.005	0.029	0.023

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$

The teacher's major's coefficient remains relatively the same except for the extraversion dimension where the coefficient's sign changes. The results still explain very little about the variation in the Big Five personality traits. However, in the case of parental involvement, one standard deviation increase in parental involvement is expected to increase the five personality dimensions by 0.077, 0.058, 0.059, 0.103, and 0.097 deviations respectively. The results from the parental involvement variable are all significant at the ten percent.

Interaction terms

Interaction between different teacher's characteristics (education and major) and mother's education are evaluated to see if the effect of teacher's characteristics on academic outcomes/ behaviors vary with mother's education. To do so, the mother's education variable is now a binary variable indicating a group of mothers with less than college education and those with college education or higher. The results of the interaction are inconclusive as shown in the table[6] below.

Table 15: Interaction term: academic outcomes vs. teacher's education* mother's education

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Education: Less than Bachelor's Degree	-0.0169	-0.0252^{+}	-0.0577	-0.0422^{+}
	(0.0570)	(0.0150)	(0.0916)	(0.0244)
Mother's Education: Bachelor's Degree or higher	0.132	0.00749	0.283*	0.00140
	(0.0800)	(0.0229)	(0.132)	(0.0372)
Teacher's Education * Mother's Education	0.0146	-0.0140	0.121	0.0308
	(0.130)	(0.0375)	(0.213)	(0.0608)
N	658	748	681	750
R^2	0.037	0.018	0.039	0.018

$^{+}$ $p < 0.10$, * $p < 0.05$

In the case of teacher's education, mother's high level of education is able to alleviate some negative effects on academic outcomes resulting from being taught by teachers with less than a bachelor's degree. The students, whose mother has a bachelor's degree or higher, are predicted to

[6] Refer to **Appendix VI** for the complete tables

score more in pre-kindergarten mathematics and language than those whose mother has less than a bachelor's degree when they were all taught by teachers with less than a bachelor's degree. The differences in mathematics and language scores are 1.46 percent and 12.1 percent. The same thing can be said to language scores in kindergarten as the students are anticipated to score 3.08 more if their parents are more educated. However, in kindergarten mathematics, the students, previously taught by pre-kindergarten teachers with less than a bachelor's degree, are expected to score 1.40 percent less if their mother received college education or higher. With that being said, the coefficients of the interaction terms are insignificant, implying that there is no strong evidence of interaction effects.

Table 16: Interaction term: academic behaviors vs. teacher's education* mother's education

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Education: Less than Bachelor's Degree	-0.000450	-0.00299	-0.00366	-0.00864	-0.00208
	(0.00661)	(0.00739)	(0.00674)	(0.0102)	(0.00562)
Mother's Education: Bachelor's Degree or higher	0.00552	-0.000894	-0.00376	0.00870	-0.000744
	(0.0101)	(0.0113)	(0.0103)	(0.0156)	(0.00859)
Teacher's Education * Mother's Education	-0.0110	0.0165	0.0166	0.00143	0.0171
	(0.0167)	(0.0187)	(0.0170)	(0.0257)	(0.0142)
N	835	835	835	835	835
R^2	0.040	0.005	0.005	0.030	0.024

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$

As for academic behaviors, the results are not conclusive. While being taught by teachers with less than a college education negatively impact the Big Five personality traits for the students, having a mother who received college education or higher can either help reduce or worsen the impacts. In four out of five personality dimensions, the negative consequence of being taught by teachers with less than a college education lessens if the students' mother has a college education or higher. The

negative impact is reduced by 0.0165, 0.0166, 0.00143, and 0.0171 in extraversion, openness, agreeableness, and emotional stability respectively. However, in conscientiousness dimension, the negative consequence worsens by 0.011.

Once again, none of the interaction terms' coefficients are significant, suggesting that there is no strong evidence of interaction effects. To expand on this finding, the interaction between teacher's education and parental involvement was also evaluated, but that only led to similar results with no significant interaction terms found.

Table 17: Interaction term: academic outcomes vs. teacher's major* mother's education

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Major: Education	0.0762	-0.0209	0.0935	0.0172
	(0.0546)	(0.0145)	(0.0883)	(0.0236)
Mother's Education: Bachelor's Degree or higher	0.234*	0.0133	0.476*	0.0502
	(0.0878)	(0.0256)	(0.145)	(0.0415)
Teacher's Major * Mother's Education	-0.215+	-0.0165	-0.331+	-0.0780
	(0.120)	(0.0345)	(0.197)	(0.0561)
N	658	748	681	750
R^2	0.042	0.017	0.042	0.016

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$

Surprisingly, the positive impacts from being taught by teachers, who were education majors in college, on direct academic outcomes reduce when mother's education is higher. The results show that the students, taught by education majors, are expected to score 21.5 percent less in pre-kindergarten math and 33.1 percent less in language if their mother has a college education or higher. Meanwhile, they are expected to score 1.65 percent less in kindergarten math and 7.80 less in kindergarten language exams. The pre-kindergarten results are significant at the ten percent level.

Table 18: Interaction term: academic behaviors vs. teacher's major* mother's education

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Major: Education	-0.0118+	-0.00260	0.00213	-0.00111	-0.00171
	(0.00635)	(0.00712)	(0.00649)	(0.00982)	(0.00542)
Mother's Education: Bachelor's Degree or higher	0.00386	-0.00375	-0.00431	0.0154	0.00554
	(0.0113)	(0.0126)	(0.0115)	(0.0174)	(0.00961)
Teacher's Major * Mother's Education	-0.00284	0.0168	0.0120	-0.0121	-0.00211
	(0.0152)	(0.0171)	(0.0156)	(0.0236)	(0.0130)
N	835	835	835	835	835
R^2	0.040	0.005	0.005	0.029	0.023

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$

Lastly, the correlation is inconclusive in this regression. Firstly, it is not clear if being an education major is positively or negatively correlated with personality traits as shown in the table above. Negative correlations can be seen in every dimension except openness. Similarly, having a mother with a college education is either be positively or negatively correlated with the Big Five personality traits. As a result, in some dimensions, namely extraversion and openness, the students with a mother who received a college education are expected to have higher Big Five personality trait scores than those whose mother has less than a college education when they are taught by education majors.

7. Robustness Checks

Robustness checks were used to assess whether the main results from Big Five personality traits' regressions were robust under a different academic semester. The main regressions used the data from the spring semester of pre-kindergarten. As timing could potentially influence the behavior of children, affecting their Big Five Personality Traits scores, it is important to ensure that the main regressions' results remain consistent regardless of when the data was collected. Due to this reason, the same regressions were run using personality traits data from the fall semester.

Similar to the main results, teacher's education and teacher's major have varying effects on the five personality dimensions- some are positive while others are negative. Parental involvement is positively correlated to all five personality dimensions. Moreover, when combined teacher's characteristics and parental involvement together, parental involvement generally plays a greater role in influencing personality traits. The results resemble those from the main regressions. The only clear difference is that the results from the fall-semester data are not as statistically significant as the results from the spring-semester data. This may be due to the fact that students had more time to adjust and respond to the change in environment when the data was collected in the spring. The full regression tables can be viewed in **Appendix VII**.

Ideally, it would also be beneficial to perform robustness checks on parental involvement index using other measures. However, due to limited data, this is only measure available in the dataset.

8. Discussion

The results from the teacher's education variable indicate that parental involvement and parent inputs might play a greater role in shaping the children's academic behaviors and academic outcomes. The coefficients of parental involvement are larger than those of teacher's education and when these two variables are added together, the coefficients of teacher's education drop quite drastically. This implies that parental involvement plays a more crucial role in determining the outcomes. The results from pre-kindergarten are economically significant, suggesting that the underlying trends between teacher's education, parental involvement, and academic outcomes might actually exist even if the analysis fails to precisely estimate the impact.

As for academic behaviors, the results send mixed signals with regard to the impact of teacher's education on the Big Five personality traits. On the other hand, it is clear that parental involvement positively affects all five dimensions of personality traits. Once again, the results suggest that parental involvement is more significant (both statistically and economically) in determining the student's

academic behavior, reinforcing the importance of family and parents in shaping a child's future.

Teacher's major in college only slightly affects the student's academic outcomes. Compared to the coefficients of parental involvement, the teacher's major variable almost has no impact on the outcomes, especially in pre-kindergarten. As for academic behaviors, there is a clear positive, statistically significant relationship between parental involvement and Big Five personality traits while the relationship is mostly not significant, both statistically and economically, in teacher's major.

It is important to notice that in academic outcomes, the coefficients become drastically smaller, and sometimes turn from positive to negative, once the scores shift from pre-kindergarten to kindergarten. One clear example of this is when pre-kindergarten teacher's education is expected to increase pre-kindergarten language scores by 12.2 percent but the predicted impact reduces to 4.49 percent in kindergarten. A similar trend can be seen in parental involvement and teacher's major variables. This underlines the story of the "fade-out" effects and showcases the importance of continuous support/ high-quality education the students should receive for the benefits to last.

Another notable finding is that, in academic outcomes, the students whose mother has a bachelor's degree are expected to earn the highest scores, followed by those whose mother has more than a bachelor's degree and those whose mother does not receive obtain a college education. This ranking parallels with the order of parental involvement index in which mothers with college education rank the highest and mothers with less than college education rank the lowest.

9. Conclusion

The main purpose of this paper is to determine whether parents or teachers play a more vital role in determining students' academic outcomes in pre-kindergarten. The answer to this question will help policymakers make a better, more efficient decision when they plan for education reform. According to the results, parent inputs, especially parental involvement, play a bigger role in shaping academic outcomes and behaviors in children. These results control for years of experience, teacher's gender, mother's education, and family income. Although the analysis is economically significant, especially in academic outcomes, data limitations prevent definitive conclusions to be made.

The data lacks the necessary information used to precisely evaluate the Big Five personality traits. Due to this reason, the evidence was drawn from the teacher's perception of the children. This method can potentially result in inconsistency as teachers who are more *qualified*, for example, those who specialize in teaching or have a bachelor's degree, might be more skilled in detecting behavior problems in children. Having these students conduct a self-evaluation in the future might lead to a better prediction but that also requires more resources to follow the students until they are mature enough.

This analysis opens avenues for future research. Firstly, the outcomes in this paper are only limited to pre-kindergarten and kindergarten, this raises questions about what the effects would look like in the long run. Therefore, future analysis of long-term academic outcomes could be conducted to study the trend of the "fade-out" effects. Secondly, the results only apply to the students in six states, the analysis would be more beneficial if it could be generalized to the entire nation. In the future, the method of adding different weights to the regression can be used to make the results more general. Lastly, the analysis only takes into account the students from public schools. This might result in a selection bias as there might be some characteristics associated with public school students that the analysis fails to account for. An extension of this analysis that includes private school students could make the results equal and representative of the population.

While the analysis is lacking in some ways, the main results can still be beneficial to educators and policymakers. While the education system tends to put more emphasis on increasing the quality of teachers by adding more requirements, the analysis shows that these requirements play an insignificant role in shaping both academic behaviors and academic outcomes in pre-kindergarten students. Increasing these requirements might prevent some *highly-skilled* teachers, who do not meet the criteria, to enter the workforce, leading to an opportunity loss.

Moreover, it is suggested that parent inputs might be more influential in outcomes than teacher inputs. Because of this, if the policymakers want to effectively increase education quality, they have to allocate resources to help the parents as well. One clear solution is to educate the parents to understand the importance of education, aiming to increase parental involvement. The analysis shows that mothers with less than a bachelor's degree are least likely to be involved with their child's education. This trend will hopefully change if the mothers are more well-informed. Furthermore, it is suggested that mothers with higher than a college degree are also less likely to be involved with their children's education when compared to mothers with a college degree. It is hard to believe that it is due to their lack of care towards education. Another explanation of this behavior is the mothers' lack of time, possibly from other commitments. Because of this, it is necessary for the policymakers to also support these highly-educated mothers so they would have more time for their children, for example, by offering paid leave for them to attend parent-teacher conferences.

In the end, the results indicate that policymakers, teachers, and parents have to work closely together in order to maximize the benefits of early childhood education and ensure a better future for the children.

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Appendices

Appendix I

Big Five Personality Factor	American Psychology Association Dictionary Description	Facets (and correlated skill adjective)	Related Skills	Analogous Childhood Temperament Skills
Conscientiousness	"The tendency to be organized, responsible, and hardworking"	Competence (efficient), Order (organized), Dutifulness (not careless), Achievement striving (ambitious), Self-discipline (not lazy), and Deliberation (not impulsive)	Grit, Perseverance, Delay of gratification, Impulse control, Achievement striving, Ambition, and Work ethic	Attention/(lack of) distractibility, Effortful control, Impulse control/delay of gratification, Persistence, Activity*
Openness to Experience	"The tendency to be open to new aesthetic, cultural, or intellectual experiences"	Fantasy (imaginative), Aesthetic (artistic), Feelings (excitable), Actions (wide interests), Ideas (curious), and Values (unconventional)		Sensory sensitivity, Pleasure in low-intensity activities, Curiosity
Extraversion	"An orientation of one's interests and energies toward the outer world of people and things rather than the inner world of subjective experience; characterized by positive affect and sociability"	Warmth (friendly), Gregariousness (sociable), Assertiveness (self-confident), Activity (energetic), Excitement seeking (adventurous), and Positive emotions (enthusiastic)		Surgency, Social dominance, Social vitality, Sensation seeking, Shyness*, Activity*, Positive emotionality, and Sociability/affiliation
Agreeableness	"The tendency to act in a cooperative, unselfish manner"	Trust (forgiving), Straight-forwardness (not demanding), Altruism (warm), Compliance (not stubborn), Modesty (not show-off), and Tender-mindedness (sympathetic)	Empathy, Perspective taking, Cooperation, and Competitiveness	Irritability*, Aggressiveness, and Willfulness
Neuroticism/ Emotional Stability	Emotional stability is "Predictability and consistency in emotional reactions, with absence of rapid mood changes." Neuroticism is "a chronic level of emotional instability and proneness to psychological distress"	Anxiety (worrying), Hostility (irritable), Depression (not contented), Self-consciousness (shy), Impulsiveness (moody), Vulnerability to stress (not self-confident)	Internal versus External, Locus of control, Core self-evaluation, Self-esteem, Self-efficacy, Optimism, and Axis I psychopathologies (mental disorders) including depression and anxiety disorders	Fearfulness/behavioral inhibition, Shyness*, Irritability*, Frustration, (Lack of) soothability, Sadness

Notes: *These temperament attributes may be related to two Big Five factors. Facets specified by the NEO-PI-R personality inventory (Costa and McCrae, 1992b). Adjectives in parentheses from the Adjective Check List (Gough and Heilbrun, 1983).
Source: Table adapted from John and Srivastava (1999).

(Heckman and Kautz, 2013)

Big Five Personality Factor	Variables
Conscientiousness	Underachieving Fidgety Poor work Concentration Poorly motivated Learning academics
Openness to Experience	Withdrawn
Extraversion	Withdrawn Timid
Agreeableness	Follow direction Aggressive Defiant
Neuroticism/ Emotional Stability	Disruptive Timid Anxious Nervous Unhappy

Appendix II

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Education: Less than Bachelor's Degree	-0.0814^{+}	-0.0276*	-0.122	-0.0449*
	(0.0490)	(0.0124)	(0.0787)	(0.0202)
Teacher's gender (female)	0.226	-0.000672	0.203	0.0593
	(0.193)	(0.0523)	(0.315)	(0.0818)
Teaching experience (years)	0.00702	0.00230	-0.0115	0.00130
	(0.00611)	(0.00158)	(0.0110)	(0.00258)
Teaching experience^2 (years)	-0.000185	-0.0000728^{+}	0.000320	-0.0000314
	(0.000152)	(0.0000398)	(0.000298)	(0.0000650)
Constant	1.579*	2.257*	2.115*	3.106*
	(0.197)	(0.0534)	(0.320)	(0.0833)
N	733	833	756	834
R^2	0.008	0.010	0.005	0.007

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Parental Involvement	0.293	-0.0152	0.337	0.00122
	(0.180)	(0.0472)	(0.293)	(0.0764)
Mother's Education: Bachelor's Degree	0.147*	0.0197	0.358*	0.0342
	(0.0748)	(0.0217)	(0.124)	(0.0353)
Mother's Education: Higher than Bachelor's Degree	0.121	-0.0301	0.270	-0.0336
	(0.107)	(0.0303)	(0.176)	(0.0493)
Family Income	0.00250*	0.000653*	0.00399*	0.00135*
	(0.00115)	(0.000316)	(0.00190)	(0.000513)
Constant	1.602*	2.240*	1.878*	3.106*
	(0.0762)	(0.0203)	(0.125)	(0.0328)
N	667	766	692	768
R^2	0.032	0.010	0.039	0.015

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Education: Less than Bachelor's Degree	-0.0127	-0.0256^{+}	-0.0329	-0.0353
	(0.0523)	(0.0140)	(0.0843)	(0.0227)
Parental Involvement	0.286	-0.0367	0.282	-0.0158
	(0.185)	(0.0485)	(0.299)	(0.0783)
Teacher's gender (female)	0.253	0.00577	0.221	0.0740
	(0.197)	(0.0568)	(0.325)	(0.0882)
Teaching experience (years)	0.00700	0.00315^{+}	-0.00715	0.00253
	(0.00626)	(0.00172)	(0.0113)	(0.00279)
Teaching experience^2 (years)	-0.000143	-0.0000866*	0.000285	-0.0000510
	(0.000153)	(0.0000425)	(0.000302)	(0.0000690)
Mother's Education: Bachelor's Degree	0.148*	0.0165	0.356*	0.0302
	(0.0755)	(0.0220)	(0.125)	(0.0357)
Mother's Education: Higher than Bachelor's Degree	0.103	-0.0300	0.235	-0.0360
	(0.110)	(0.0311)	(0.180)	(0.0505)
Family Income	0.00256*	0.000619^{+}	0.00371^{+}	0.00122*
	(0.00117)	(0.000324)	(0.00193)	(0.000526)
Constant	1.302*	2.235*	1.727*	3.041*
	(0.218)	(0.0621)	(0.358)	(0.0962)
N	658	748	681	750
R^2	0.037	0.020	0.039	0.019

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$

Appendix III

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Education: Less than Bachelor's Degree	-0.00587	0.000297	-0.00206	-0.00910	-0.00156
	(0.00542)	(0.00619)	(0.00593)	(0.00835)	(0.00452)
Teacher's gender (female)	-0.0182	-0.0106	-0.00773	0.0123	-0.0143
	(0.0207)	(0.0236)	(0.0227)	(0.0319)	(0.0173)
Teaching experience (years)	0.000893	-0.0000913	0.0000468	0.000927	0.000328
	(0.000716)	(0.000818)	(0.000784)	(0.00110)	(0.000598)
Teaching experience^2 (years)	-0.0000548*	0.00000716	0.00000299	-0.0000592*	-0.0000254+
	(0.0000184)	(0.0000210)	(0.0000201)	(0.0000284)	(0.0000154)
Constant	1.006*	0.999*	0.999*	0.966*	1.003*
	(0.0213)	(0.0243)	(0.0233)	(0.0328)	(0.0178)
N	989	989	989	989	989
R^2	0.023	0.001	0.001	0.012	0.009

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Parental Involvement	0.0561*	0.0492+	0.0422+	0.0992*	0.0550*
	(0.0216)	(0.0253)	(0.0227)	(0.0323)	(0.0187)
Mother's Education: Bachelor's Degree	0.0107	-0.00467	-0.00108	0.0145	0.00144
	(0.00980)	(0.0115)	(0.0103)	(0.0147)	(0.00850)
Mother's Education: Higher than Bachelor's Degree	-0.0216	0.00940	0.00970	-0.00377	0.00325
	(0.0143)	(0.0167)	(0.0150)	(0.0213)	(0.0124)
Family Income	0.000183	0.0000399	-0.0000672	0.000142	0.0000769
	(0.000145)	(0.000170)	(0.000152)	(0.000216)	(0.000125)
Constant	0.954*	0.968*	0.977*	0.925*	0.961*
	(0.00925)	(0.0109)	(0.00974)	(0.0138)	(0.00803)
N	855	855	855	855	855
R^2	0.016	0.005	0.005	0.015	0.012

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Education: Less than Bachelor's Degree	-0.00105	-0.000931	-0.00159	-0.00792	0.000364
	(0.00614)	(0.00689)	(0.00628)	(0.00949)	(0.00524)
Parental Involvement	0.0477*	0.0393	0.0356	0.0953*	0.0510*
	(0.0213)	(0.0239)	(0.0218)	(0.0329)	(0.0182)
Teacher's gender (female)	-0.0184	-0.0102	-0.00699	0.0137	-0.0154
	(0.0216)	(0.0242)	(0.0221)	(0.0334)	(0.0185)
Teaching experience (years)	0.00102	-0.000274	-0.0000824	0.000277	-0.0000755
	(0.000772)	(0.000865)	(0.000789)	(0.00119)	(0.000659)
Teaching experience^2 (years)	-0.0000582*	0.00000979	0.00000533	-0.0000511+	-0.0000191
	(0.0000194)	(0.0000217)	(0.0000198)	(0.0000299)	(0.0000165)
Mother's Education: Bachelor's Degree	0.0105	0.00114	-0.00180	0.0133	0.00388
	(0.00960)	(0.0108)	(0.00981)	(0.0148)	(0.00819)
Mother's Education: Higher than Bachelor's Degree	-0.0204	0.0124	0.00991	-0.00218	0.00629
	(0.0141)	(0.0158)	(0.0144)	(0.0218)	(0.0120)
Family Income	0.000148	-0.0000743	-0.000101	0.0000829	-0.0000256
	(0.000143)	(0.000161)	(0.000146)	(0.000221)	(0.000122)
Constant	0.979*	0.988*	0.989*	0.928*	0.987*
	(0.0243)	(0.0273)	(0.0249)	(0.0375)	(0.0207)
N	835	835	835	835	835
R^2	0.040	0.005	0.005	0.030	0.023

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$

Appendix IV

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Major: Education	0.0419	-0.0180	0.0345	0.0117
	(0.0477)	(0.0121)	(0.0766)	(0.0198)
Teacher's gender (female)	0.201	-0.00186	0.172	0.0450
	(0.194)	(0.0524)	(0.317)	(0.0821)
Teaching experience (years)	0.00711	0.00282^{+}	-0.0111	0.00155
	(0.00614)	(0.00159)	(0.0110)	(0.00259)
Teaching experience^2 (years)	-0.000165	-0.0000776^{+}	0.000347	-0.0000248
	(0.000153)	(0.0000401)	(0.000299)	(0.0000656)
Constant	1.545*	2.249*	2.069*	3.091*
	(0.197)	(0.0533)	(0.319)	(0.0833)
N	733	833	756	834
R^2	0.005	0.007	0.002	0.002

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Major: Education	0.0329	-0.0233^{+}	0.0297	0.00428
	(0.0489)	(0.0132)	(0.0794)	(0.0214)
Parental Involvement	0.292	-0.0276	0.297	-0.00170
	(0.183)	(0.0482)	(0.295)	(0.0779)
Teacher's gender (female)	0.240	0.00769	0.205	0.0657
	(0.198)	(0.0569)	(0.327)	(0.0884)
Teaching experience (years)	0.00673	0.00377*	-0.00716	0.00287
	(0.00626)	(0.00172)	(0.0113)	(0.00280)
Teaching experience^2 (years)	-0.000131	-0.0000940*	0.000297	-0.0000478
	(0.000153)	(0.0000428)	(0.000303)	(0.0000696)
Mother's Education: Bachelor's Degree	0.149*	0.0200	0.358*	0.0345
	(0.0754)	(0.0219)	(0.125)	(0.0356)
Mother's Education: Higher than Bachelor's Degree	0.0994	-0.0307	0.230	-0.0394
	(0.110)	(0.0311)	(0.180)	(0.0506)
Family Income	0.00261*	0.000697*	0.00380*	0.00132*
	(0.00116)	(0.000321)	(0.00191)	(0.000522)
Constant	1.291*	2.220*	1.704*	3.018*
	(0.214)	(0.0614)	(0.353)	(0.0953)
N	658	748	681	750
R^2	0.037	0.020	0.039	0.016

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$

Appendix V

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Major: Education	-0.0121*	-0.000507	0.00286	-0.00388	-0.00198
	(0.00526)	(0.00602)	(0.00577)	(0.00813)	(0.00440)
Teacher's gender (female)	-0.0167	-0.0105	-0.00866	0.0117	-0.0141
	(0.0207)	(0.0236)	(0.0227)	(0.0319)	(0.0173)
Teaching experience (years)	0.00111	-0.0000865	0.0000223	0.00105	0.000368
	(0.000718)	(0.000821)	(0.000786)	(0.00111)	(0.000600)
Teaching experience^2 (years)	-0.0000584*	0.00000696	0.00000415	-0.0000597*	-0.0000259+
	(0.0000185)	(0.0000211)	(0.0000202)	(0.0000285)	(0.0000154)
Constant	1.005*	0.999*	0.998*	0.963*	1.003*
	(0.0212)	(0.0242)	(0.0232)	(0.0327)	(0.0177)
N	989	989	989	989	989
R^2	0.027	0.001	0.001	0.011	0.009

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Major: Education	-0.0120*	0.000192	0.00409	-0.00303	-0.00210
	(0.00578)	(0.00650)	(0.00592)	(0.00895)	(0.00494)
Parental Involvement	0.0476*	0.0397+	0.0364+	0.0980*	0.0508*
	(0.0211)	(0.0238)	(0.0217)	(0.0328)	(0.0181)
Teacher's gender (female)	-0.0161	-0.0103	-0.00799	0.0134	-0.0149
	(0.0216)	(0.0243)	(0.0221)	(0.0334)	(0.0185)
Teaching experience (years)	0.00120	-0.000267	-0.000123	0.000405	-0.0000497
	(0.000771)	(0.000867)	(0.000791)	(0.00120)	(0.000660)
Teaching experience^2 (years)	-0.0000625*	0.00000991	0.00000691	-0.0000518+	-0.0000199
	(0.0000194)	(0.0000218)	(0.0000199)	(0.0000301)	(0.0000166)
Mother's Education: Bachelor's Degree	0.0107	0.00125	-0.00163	0.0143	0.00385
	(0.00954)	(0.0107)	(0.00978)	(0.0148)	(0.00817)
Mother's Education: Higher than Bachelor's Degree	-0.0198	0.0123	0.00952	-0.00266	0.00645
	(0.0141)	(0.0158)	(0.0144)	(0.0218)	(0.0120)
Family Income	0.000150	-0.0000714	-0.0000961	0.000107	-0.0000268
	(0.000142)	(0.000159)	(0.000145)	(0.000219)	(0.000121)
Constant	0.980*	0.987*	0.987*	0.923*	0.988*
	(0.0239)	(0.0269)	(0.0245)	(0.0370)	(0.0204)
N	835	835	835	835	835
R^2	0.045	0.005	0.005	0.029	0.023

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$

Appendix VI

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Education: Less than Bachelor's Degree	-0.0169	-0.0252^{+}	-0.0577	-0.0422^{+}
	(0.0570)	(0.0150)	(0.0916)	(0.0244)
Parental Involvement	0.287	-0.0382	0.289	-0.0131
	(0.185)	(0.0487)	(0.299)	(0.0786)
Teacher's gender (female)	0.249	0.00338	0.208	0.0698
	(0.197)	(0.0569)	(0.325)	(0.0882)
Teaching experience (years)	0.00693	0.00319^{+}	-0.00752	0.00245
	(0.00627)	(0.00173)	(0.0113)	(0.00280)
Teaching experience^2 (years)	-0.000143	-0.0000887*	0.000289	-0.0000511
	(0.000153)	(0.0000426)	(0.000302)	(0.0000692)
Mother's Education: Bachelor's Degree or higher	0.132	0.00749	0.283*	0.00140
	(0.0800)	(0.0229)	(0.132)	(0.0372)
Family Income	0.00249*	0.000559^{+}	0.00351^{+}	0.00113*
	(0.00116)	(0.000321)	(0.00190)	(0.000521)
Teacher's Education * Mother's Education	0.0146	-0.0140	0.121	0.0308
	(0.130)	(0.0375)	(0.213)	(0.0608)
Constant	1.309*	2.239*	1.756*	3.050*
	(0.218)	(0.0621)	(0.358)	(0.0962)
N	658	748	681	750
R^2	0.037	0.018	0.039	0.018

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Education: Less than Bachelor's Degree	-0.000450	-0.00299	-0.00366	-0.00864	-0.00208
	(0.00661)	(0.00739)	(0.00674)	(0.0102)	(0.00562)
Parental Involvement	0.0465*	0.0409+	0.0372+	0.0953*	0.0525*
	(0.0214)	(0.0239)	(0.0218)	(0.0330)	(0.0182)
Teacher's gender (female)	-0.0195	-0.00995	-0.00676	0.0130	-0.0156
	(0.0217)	(0.0242)	(0.0221)	(0.0334)	(0.0184)
Teaching experience (years)	0.00104	-0.000315	-0.000124	0.000270	-0.000121
	(0.000775)	(0.000867)	(0.000790)	(0.00119)	(0.000659)
Teaching experience^2 (years)	-0.0000594*	0.0000109	0.00000644	-0.0000513+	-0.0000181
	(0.0000194)	(0.0000217)	(0.0000198)	(0.0000300)	(0.0000165)
Mother's Education: Bachelor's Degree or higher	0.00552	-0.000894	-0.00376	0.00870	-0.000744
	(0.0101)	(0.0113)	(0.0103)	(0.0156)	(0.00859)
Family Income	0.000105	-0.0000607	-0.0000869	0.0000605	-0.0000248
	(0.000142)	(0.000159)	(0.000145)	(0.000219)	(0.000121)
Teacher's Education * Mother's Education	-0.0110	0.0165	0.0166	0.00143	0.0171
	(0.0167)	(0.0187)	(0.0170)	(0.0257)	(0.0142)
Constant	0.981*	0.988*	0.989*	0.929*	0.988*
	(0.0243)	(0.0272)	(0.0248)	(0.0375)	(0.0207)
N	835	835	835	835	835
R^2	0.040	0.005	0.005	0.030	0.024

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$

	(1) Children outcome: Mathematics	(2) Children outcome (K): Mathematics	(3) Children outcome: Language	(4) Children outcome (K): Language
Teacher's Major: Education	0.0762	-0.0209	0.0935	0.0172
	(0.0546)	(0.0145)	(0.0883)	(0.0236)
Parental Involvement	0.295	-0.0271	0.293	-0.000905
	(0.182)	(0.0482)	(0.295)	(0.0779)
Teacher's gender (female)	0.242	0.00528	0.199	0.0644
	(0.197)	(0.0570)	(0.326)	(0.0883)
Teaching experience (years)	0.00665	0.00379*	-0.00666	0.00288
	(0.00625)	(0.00173)	(0.0113)	(0.00280)
Teaching experience^2 (years)	-0.000133	-0.0000955*	0.000278	-0.0000502
	(0.000153)	(0.0000428)	(0.000303)	(0.0000696)
Mother's Education: Bachelor's Degree or higher	0.234*	0.0133	0.476*	0.0502
	(0.0878)	(0.0256)	(0.145)	(0.0415)
Family Income	0.00260*	0.000637*	0.00371+	0.00124*
	(0.00115)	(0.000319)	(0.00189)	(0.000518)
Teacher's Major * Mother's Education	-0.215+	-0.0165	-0.331+	-0.0780
	(0.120)	(0.0345)	(0.197)	(0.0561)
Constant	1.270*	2.223*	1.684*	3.016*
	(0.214)	(0.0615)	(0.352)	(0.0954)
N	658	748	681	750
R^2	0.042	0.017	0.042	0.016

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
Teacher's Major: Education	-0.0118^{+}	-0.00260	0.00213	-0.00111	-0.00171
	(0.00635)	(0.00712)	(0.00649)	(0.00982)	(0.00542)
Parental Involvement	0.0477*	0.0396^{+}	0.0363^{+}	0.0981*	0.0508*
	(0.0212)	(0.0238)	(0.0217)	(0.0328)	(0.0181)
Teacher's gender (female)	-0.0174	-0.0103	-0.00787	0.0130	-0.0148
	(0.0216)	(0.0243)	(0.0221)	(0.0334)	(0.0185)
Teaching experience (years)	0.00121	-0.000271	-0.000127	0.000410	-0.0000500
	(0.000773)	(0.000867)	(0.000790)	(0.00120)	(0.000660)
Teaching experience^2 (years)	-0.0000632*	0.0000102	0.00000721	-0.0000522^{+}	-0.0000198
	(0.0000195)	(0.0000218)	(0.0000199)	(0.0000301)	(0.0000166)
Mother's Education: Bachelor's Degree or higher	0.00386	-0.00375	-0.00431	0.0154	0.00554
	(0.0113)	(0.0126)	(0.0115)	(0.0174)	(0.00961)
Family Income	0.000110	-0.0000606	-0.0000840	0.0000869	-0.0000228
	(0.000140)	(0.000158)	(0.000144)	(0.000217)	(0.000120)
Teacher's Major * Mother's Education	-0.00284	0.0168	0.0120	-0.0121	-0.00211
	(0.0152)	(0.0171)	(0.0156)	(0.0236)	(0.0130)
Constant	0.983*	0.988*	0.988*	0.923*	0.987*
	(0.0240)	(0.0269)	(0.0245)	(0.0371)	(0.0205)
N	835	835	835	835	835
R^2	0.040	0.005	0.005	0.029	0.023

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$

Appendix VII

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
PANEL A					
Teacher's Education: Less than Bachelor's Degree	-0.0156*	0.00408	0.00439	-0.0144+	-0.00215
	(0.00503)	(0.00811)	(0.00723)	(0.00808)	(0.00552)
N	989	989	989	989	989
PANEL B	(1)	(2)	(3)	(4)	(5)
Parental Involvement	0.00180	0.0418	0.0455	0.0413	0.0365+
	(0.0194)	(0.0323)	(0.0297)	(0.0304)	(0.0201)
N	855	855	855	855	855
PANEL C	(1)	(2)	(3)	(4)	(5)
Teacher's Education: Less than Bachelor's Degree	-0.0138*	0.00227	0.00433	-0.00805	-0.00290
	(0.00562)	(0.00926)	(0.00847)	(0.00897)	(0.00591)
Parental Involvement	-0.00964	0.0367	0.0422	0.0347	0.0323
	(0.0195)	(0.0321)	(0.0294)	(0.0311)	(0.0205)
N	835	835	835	835	835
PANEL D	(1)	(2)	(3)	(4)	(5)
Teacher's Education: Less than Bachelor's Degree	-0.0149*	0.00180	0.00318	-0.0106	-0.00162
	(0.00604)	(0.00995)	(0.00910)	(0.00964)	(0.00635)
Mother's Education: Bachelor's Degree or higher	-0.00894	0.0370	0.0430	0.0363	0.0315
	(0.0196)	(0.0322)	(0.0295)	(0.0312)	(0.0206)
Teacher's Education * Mother's Education	0.00766	0.00332	0.00804	0.0181	-0.00893
	(0.0154)	(0.0254)	(0.0232)	(0.0246)	(0.0162)
N	835	835	835	835	835

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$

	(1) Personality Traits: Conscientiousness	(2) Personality Traits: Extraversion	(3) Personality Traits: Openness	(4) Personality Traits: Agreeableness	(5) Personality Traits: Emotional Stability
PANEL A					
Teacher's Major: Education	-0.00689	-0.00149	-0.00299	0.00403	0.000742
	(0.00492)	(0.00789)	(0.00704)	(0.00788)	(0.00537)
N	989	989	989	989	989
PANEL B:	(1)	(2)	(3)	(4)	(5)
Parental Involvement	0.00180	0.0418	0.0455	0.0413	0.0365+
	(0.0194)	(0.0323)	(0.0297)	(0.0304)	(0.0201)
N	855	855	855	855	855
PANEL C:	(1)	(2)	(3)	(4)	(5)
Teacher's Major: Education	-0.00688	-0.00469	-0.00508	0.00613	0.000191
	(0.00531)	(0.00873)	(0.00798)	(0.00846)	(0.00557)
Parental Involvement	-0.00508	0.0357	0.0405	0.0378	0.0333
	(0.0194)	(0.0320)	(0.0292)	(0.0310)	(0.0204)
N	835	835	835	835	835
PANEL D:	(1)	(2)	(3)	(4)	(5)
Teacher's Major: Education	-0.00508	-0.0109	-0.00852	0.00847	-0.00273
	(0.00583)	(0.00957)	(0.00876)	(0.00929)	(0.00611)
Mother's Education: Bachelor's Degree or higher	-0.00504	0.0356	0.0404	0.0378	0.0333
	(0.0194)	(0.0319)	(0.0292)	(0.0310)	(0.0204)
Teacher's Education * Mother's Education	-0.0105	0.0364	0.0201	-0.0137	0.0171
	(0.0140)	(0.0230)	(0.0210)	(0.0223)	(0.0147)
N	835	835	835	835	835

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$